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Air Force Research Laboratory (AFMC)
AFRL/PRSP
5 Pollux Drive
Edwards AFB CA 93524-7048

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Air Force Research Laboratory (AFMC)
AFRL/PRS
5 Pollux Drive
Edwards AFB CA 93524-7048

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7 items enclosed

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO) 12 July 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2002-180**
C.T. Liu (PRSM), "Multi-Scale Strain Measurements of a Multi-Phase Material"

MESO 2002 **(Statement A)**
(Aalborg, Denmark, 26-30 August 2002) (Deadline: 21 Aug 02)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.
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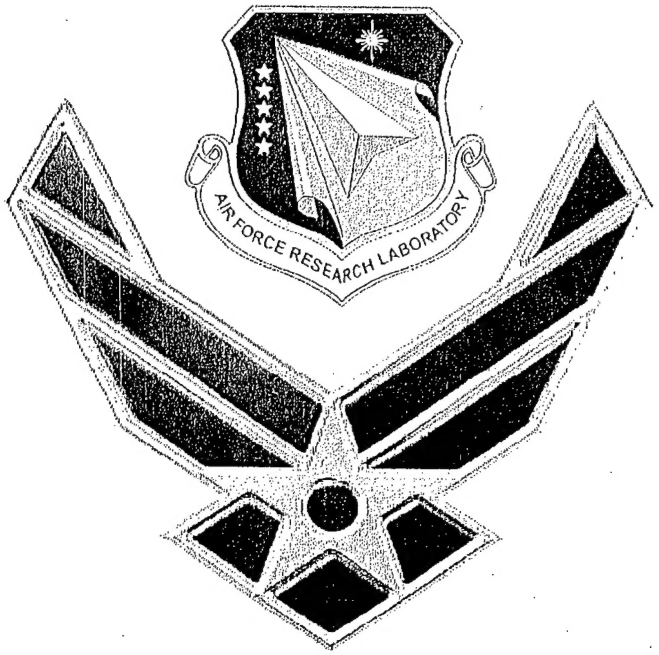
PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

Multi-Scale Strain Measurements of a Multi-Phase Material



C. T. Liu
AFRL/PRSM
10 E. Saturn Blvd.
Edwards AFB CA 93524-7680, U.S.A

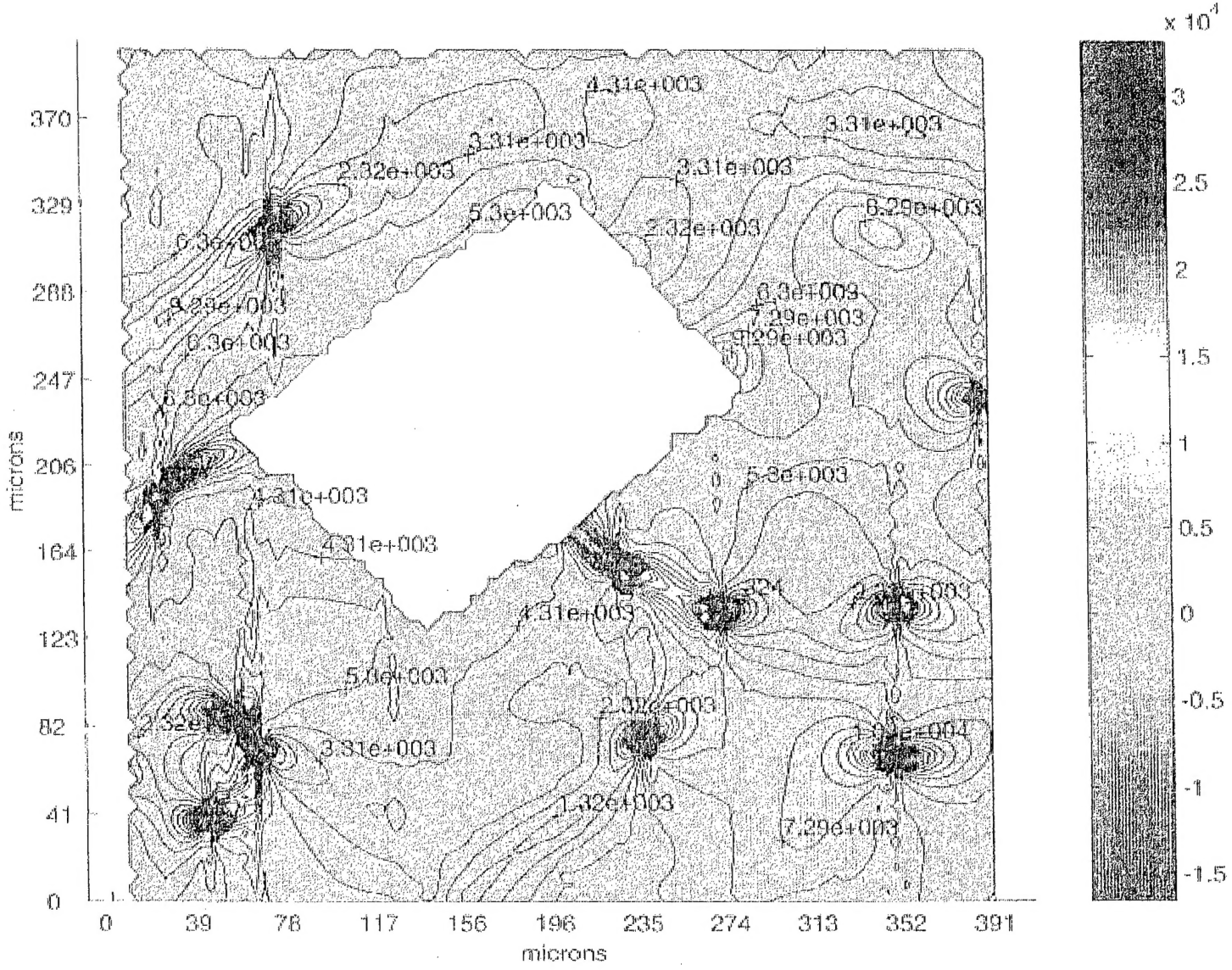
Objectives

- Investigate the Effects of Time and the applied load on the Strain Distributions near a Filler Particle under Constant Load Conditions.

- Investigate the Effect of Microstructure on the Strain Distributions near a Crack Tip.

- Investigate the Damage and Crack Growth Mechanisms in the Material under a Constant Strain Rate Condition.

ε_y for 11.34 psi at 30 sec



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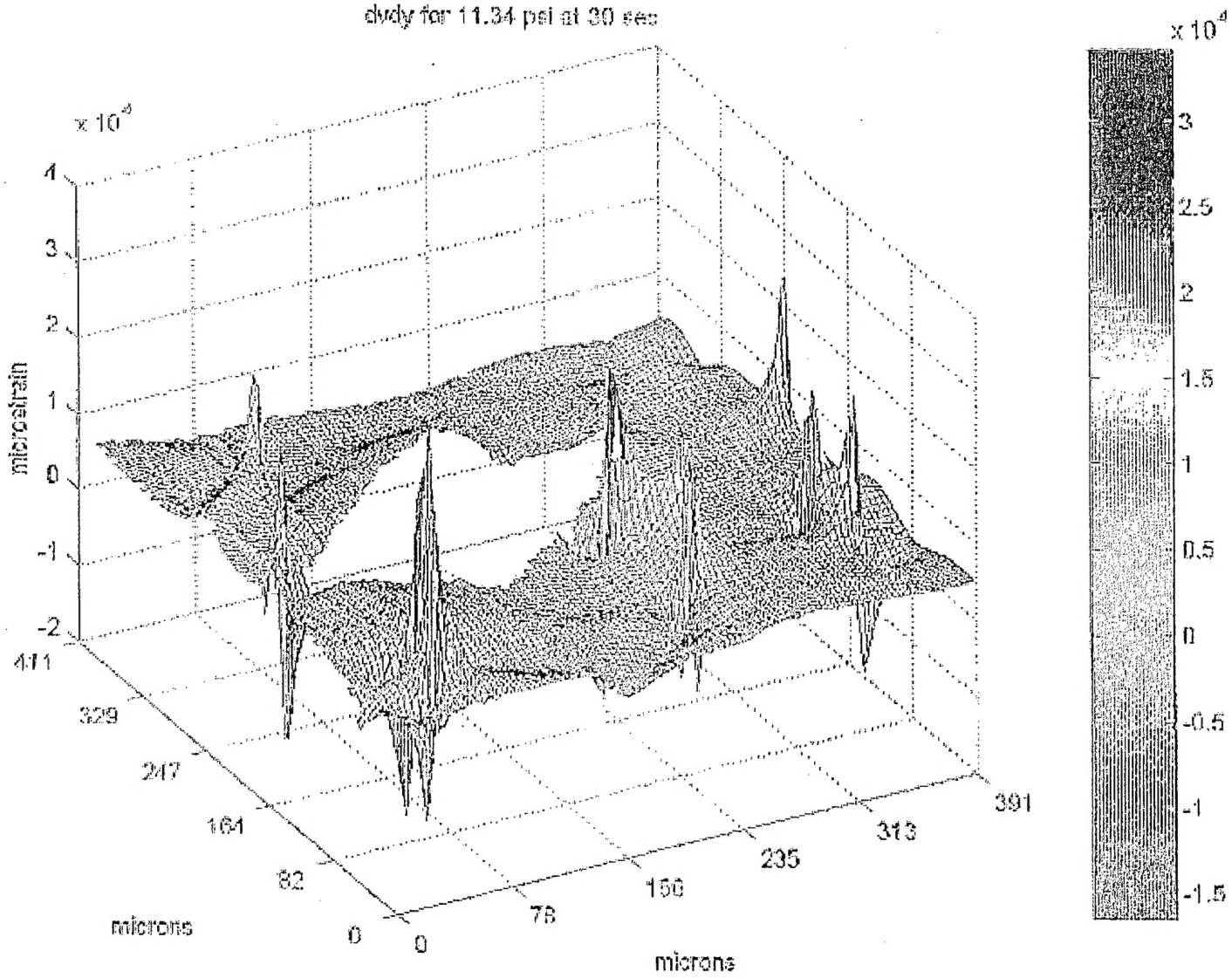

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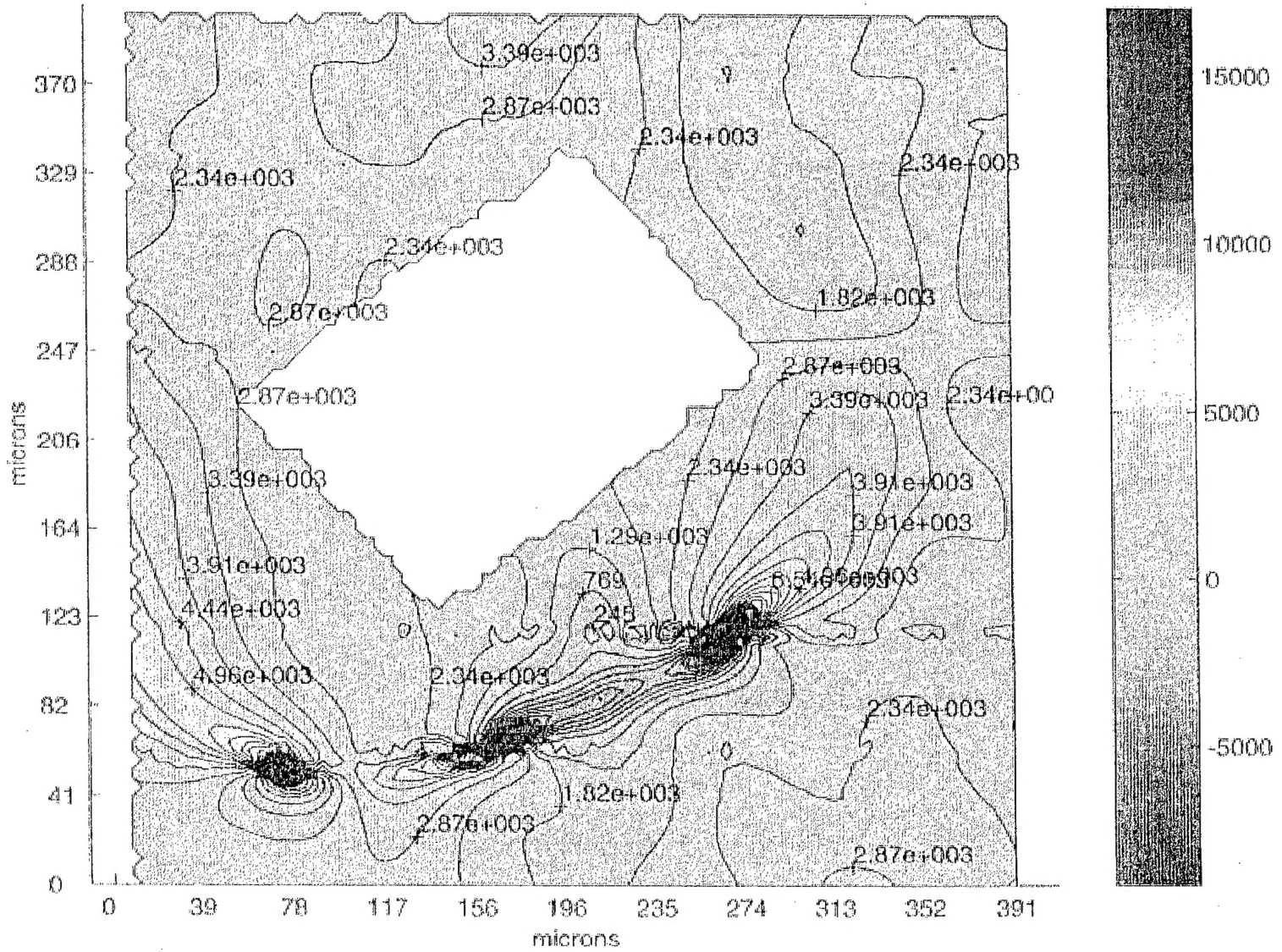

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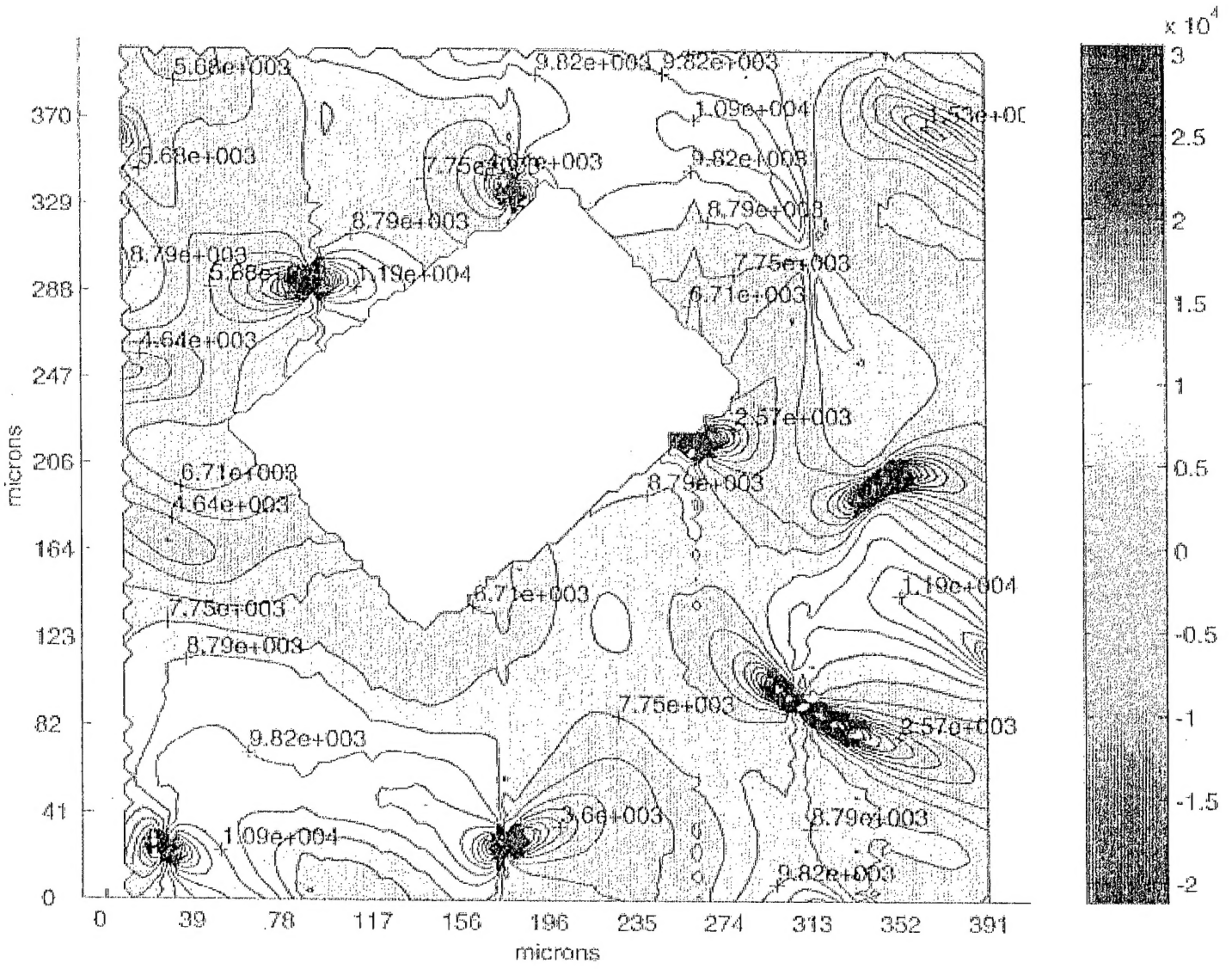

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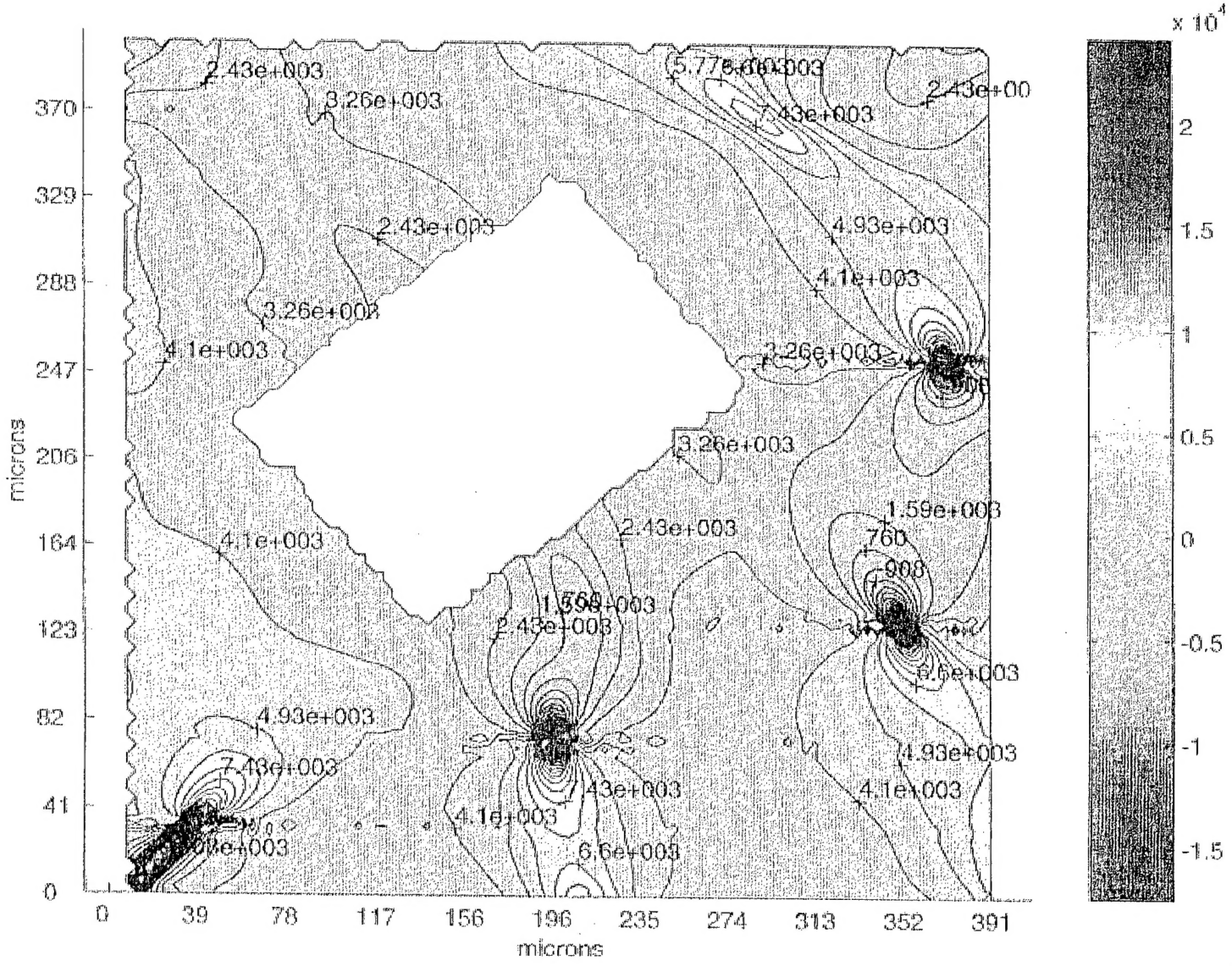

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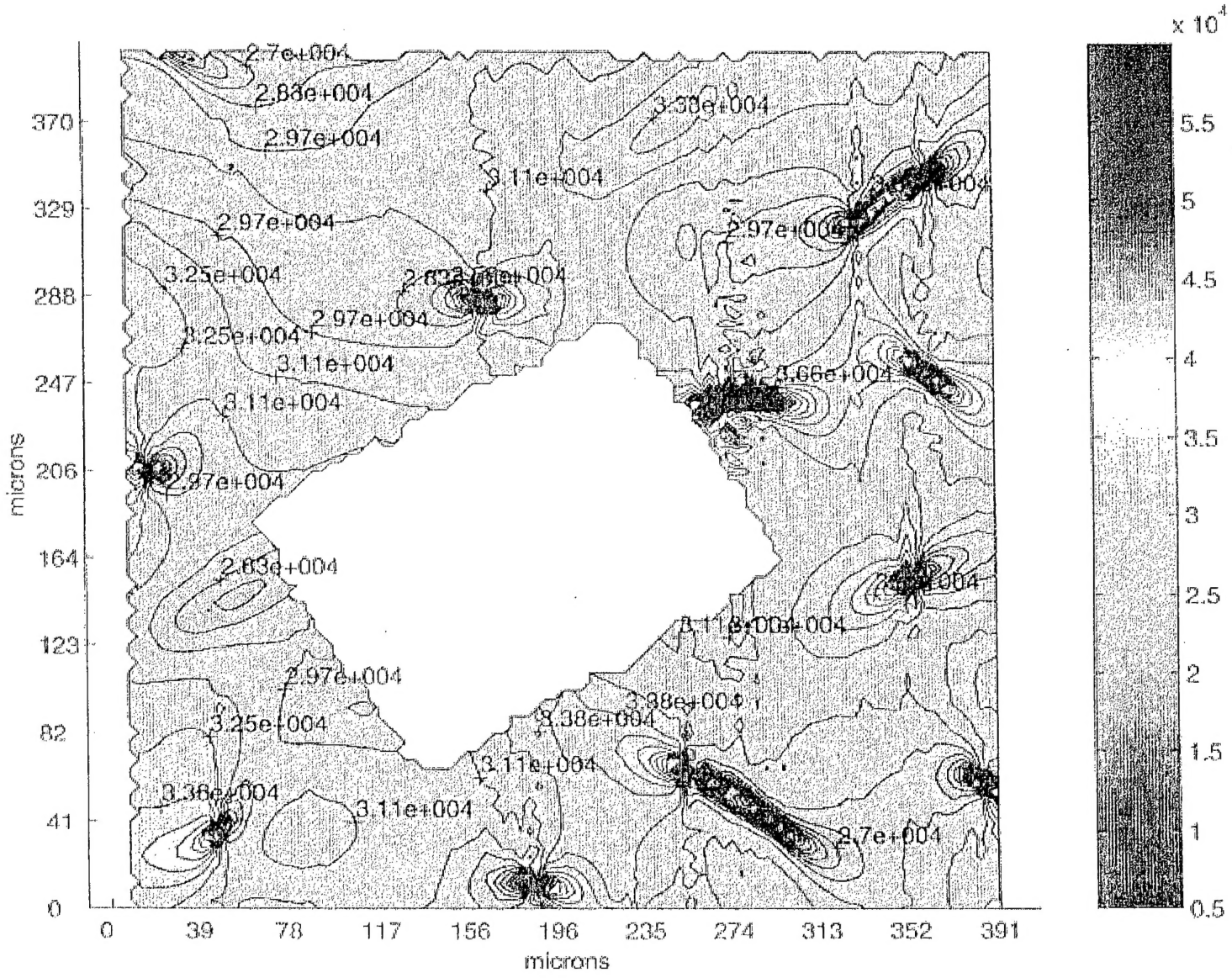

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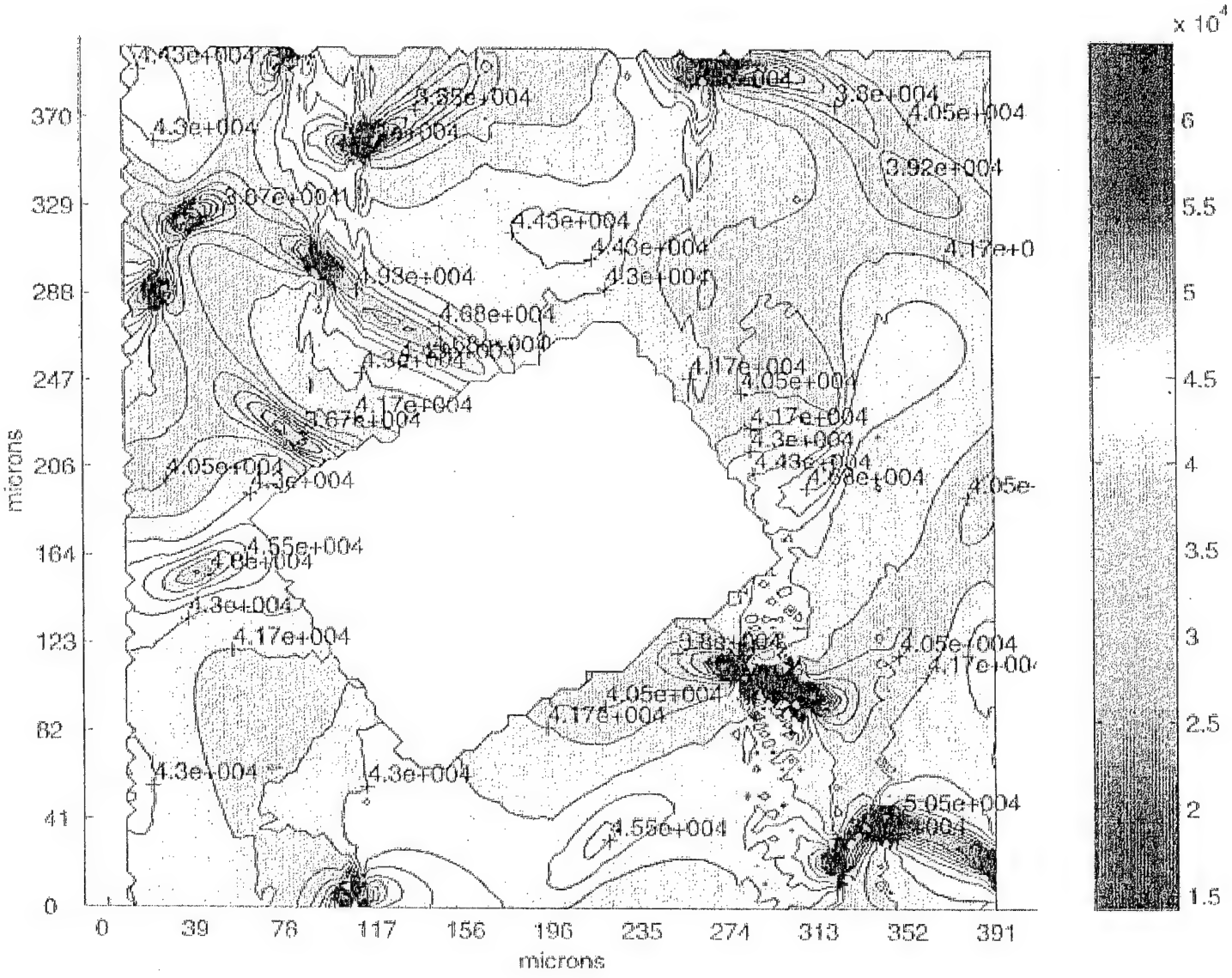
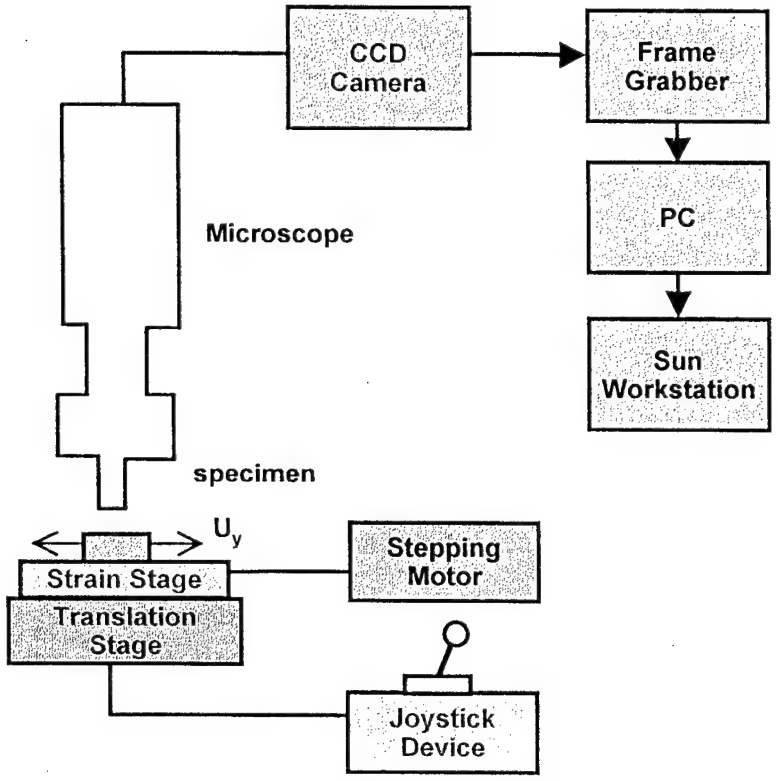
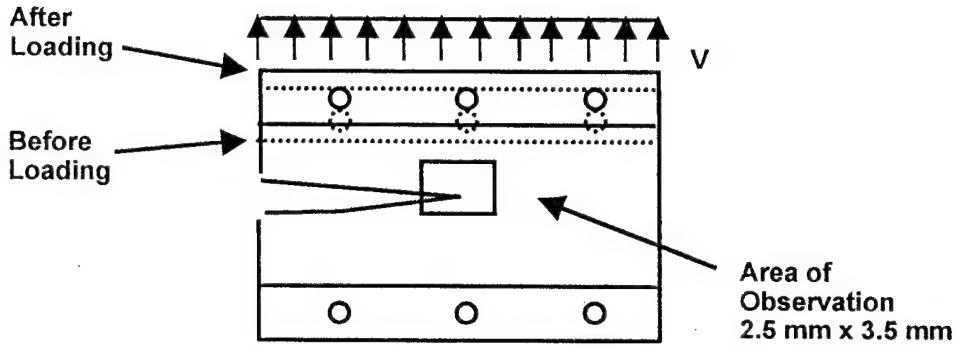
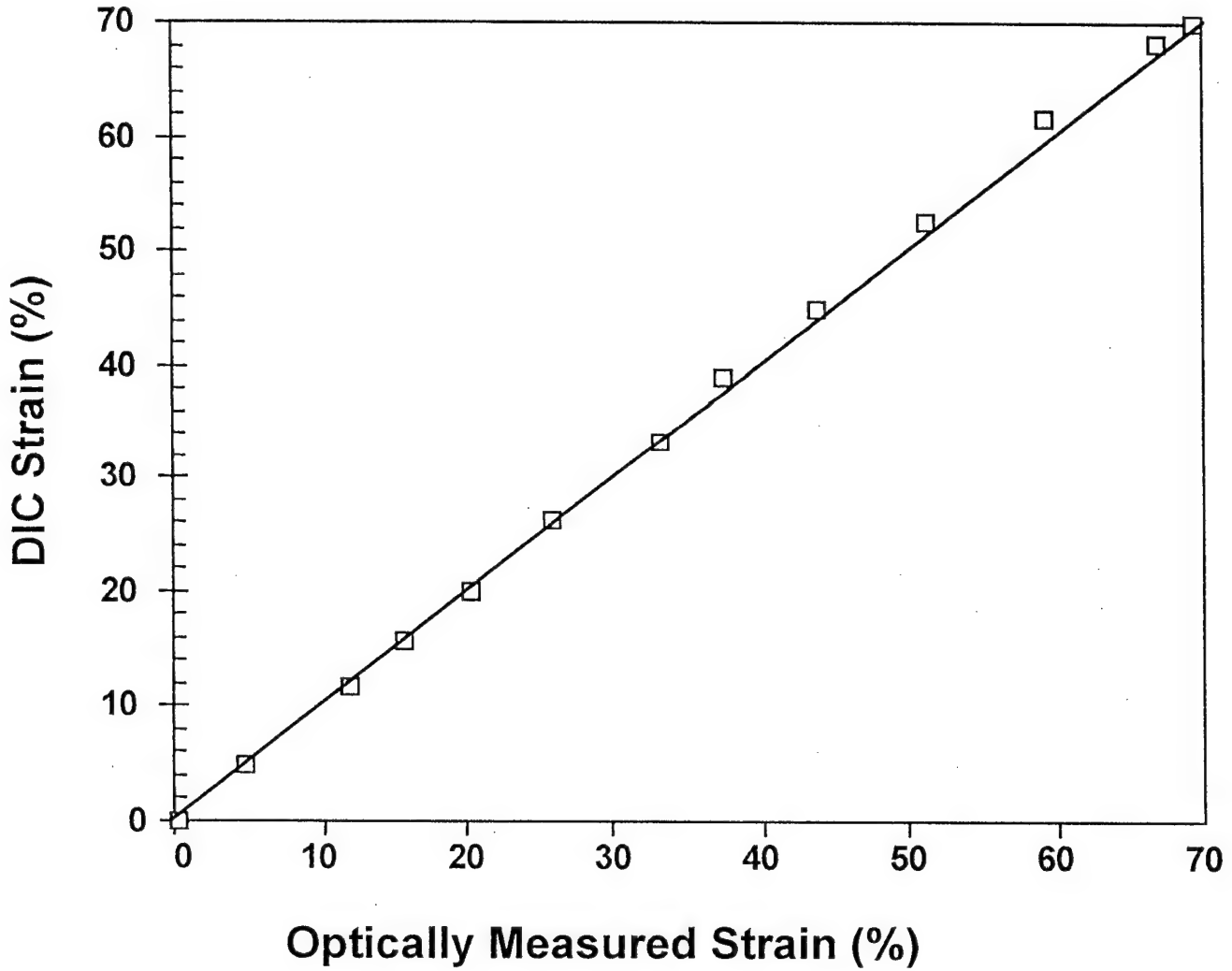


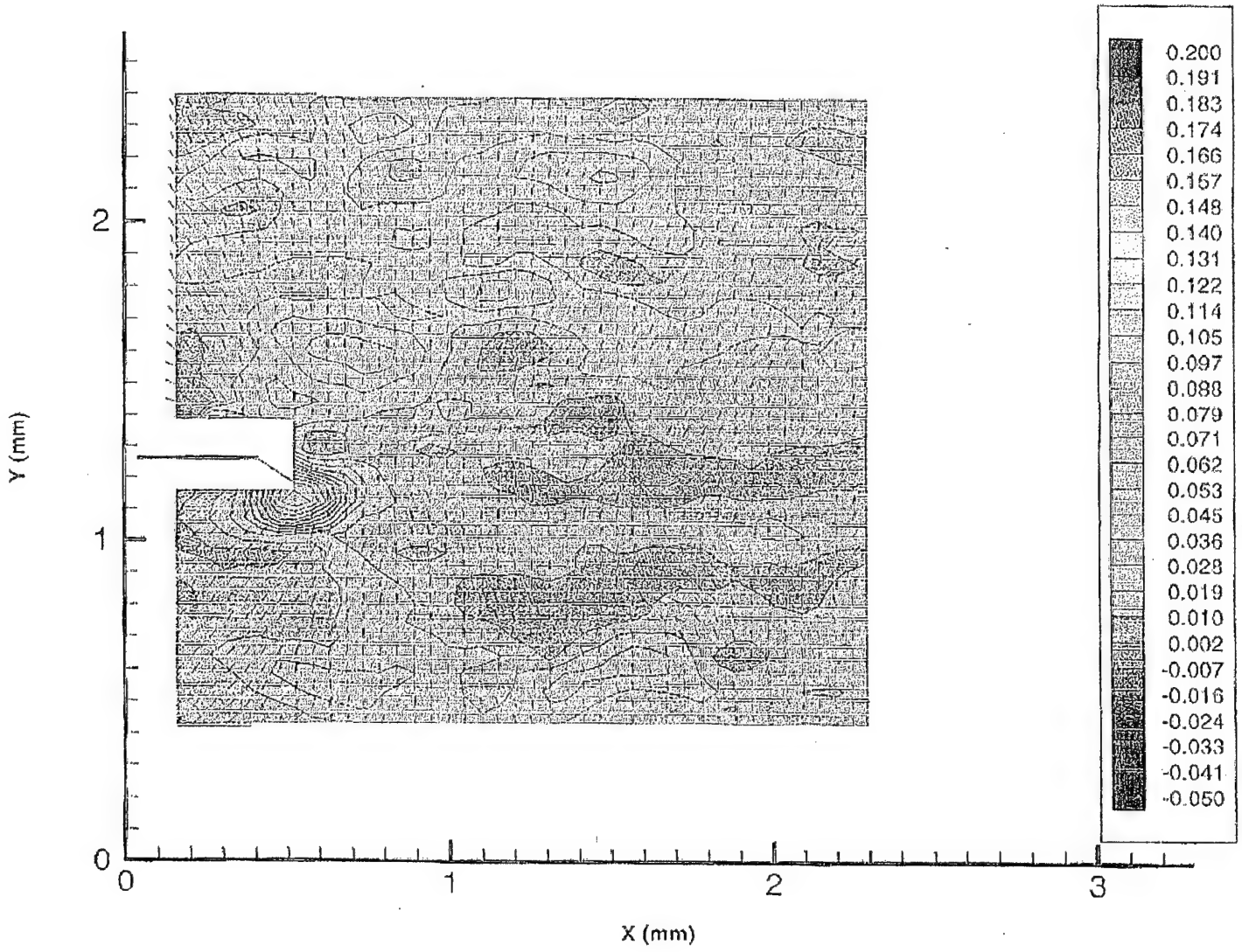

CCD Camera
Frame Grabber
PC
Sun Workstation
Microscope
specimen
U_y
Strain Stage
Translation Stage
Stepping Motor
Joystick Device


After Loading
Before Loading
V
Area of Observation
2.5 mm x 3.5 mm

Calibration



Maximum Principal Strain Distribution of 2.0% Far Field Strain During Loading



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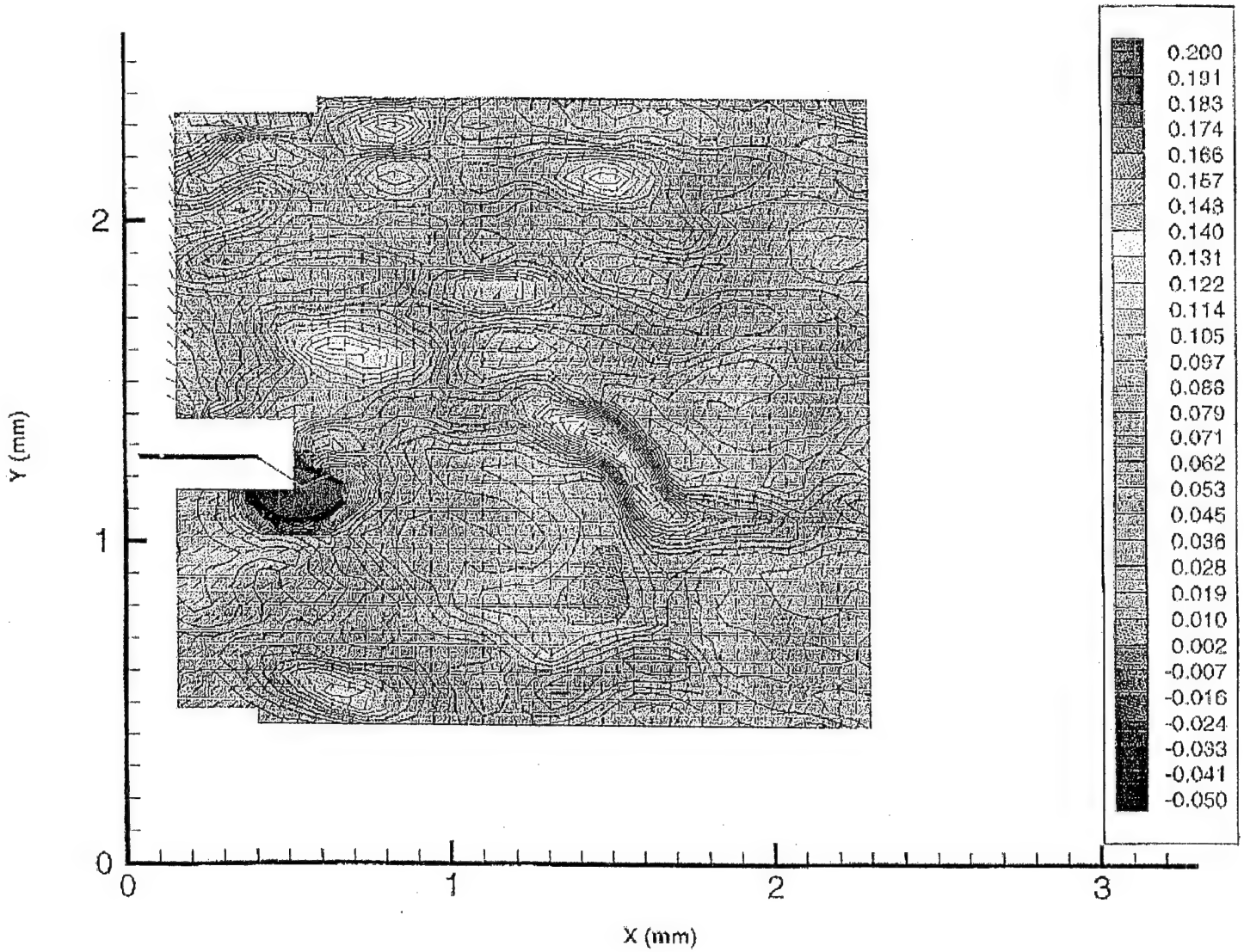

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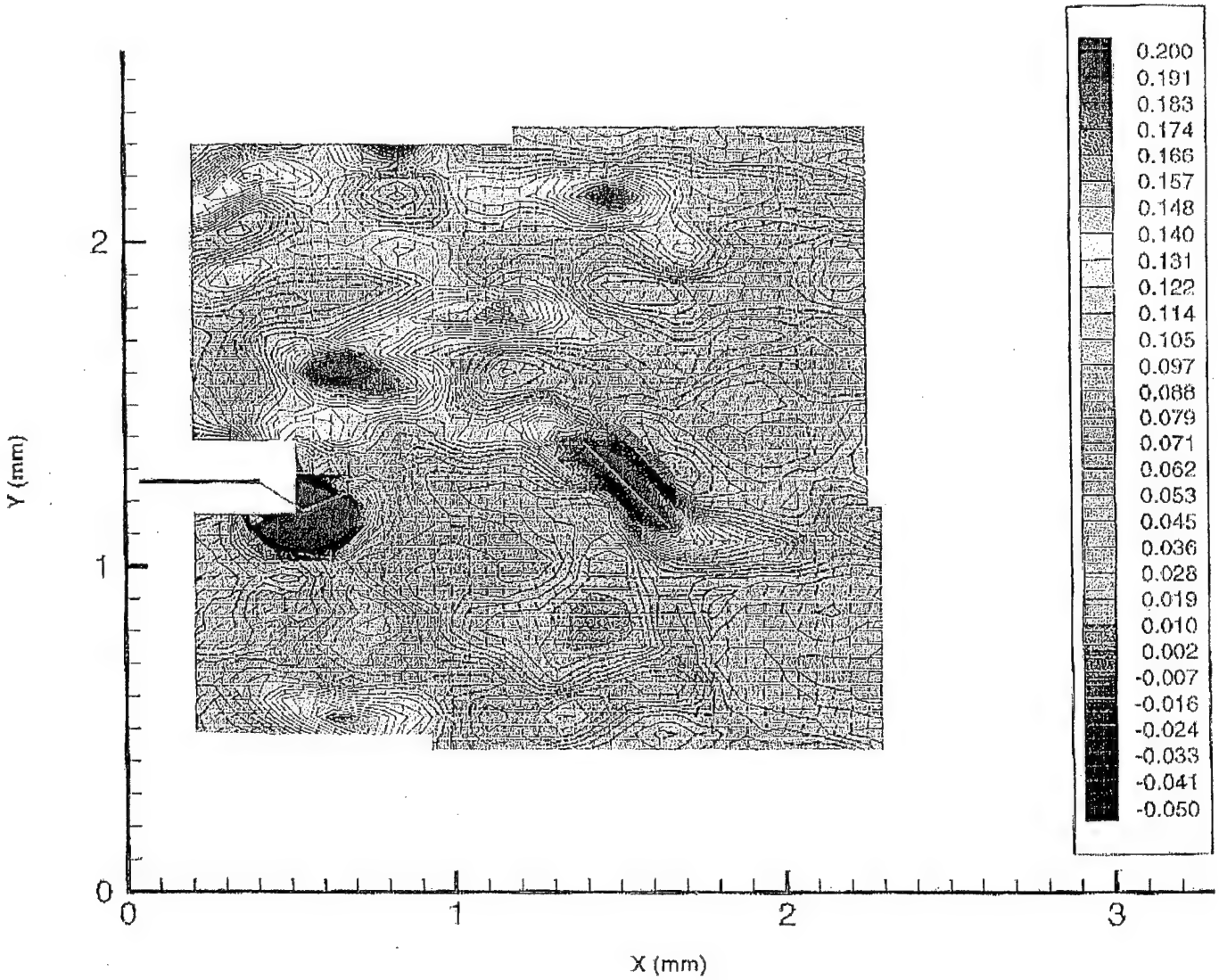
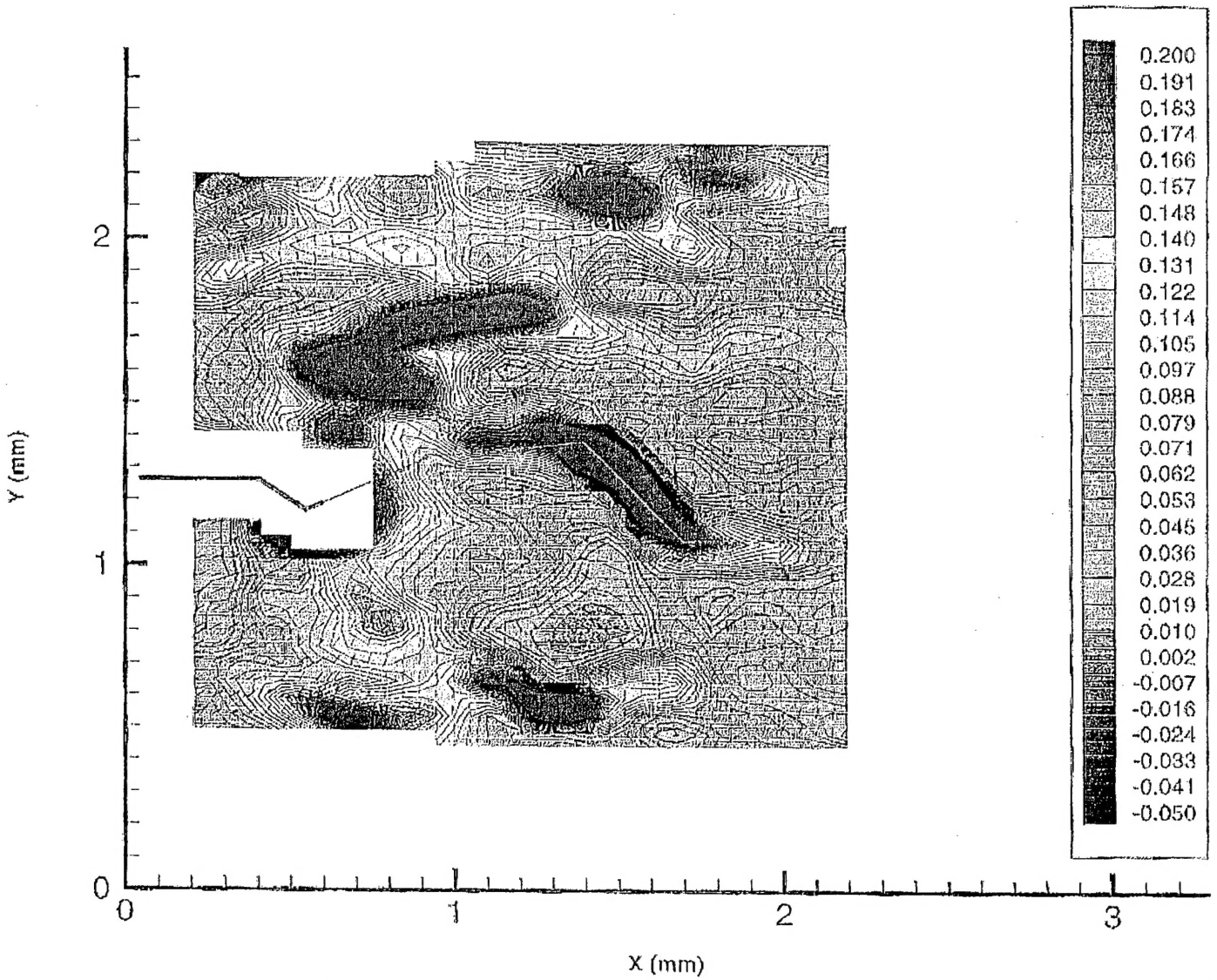
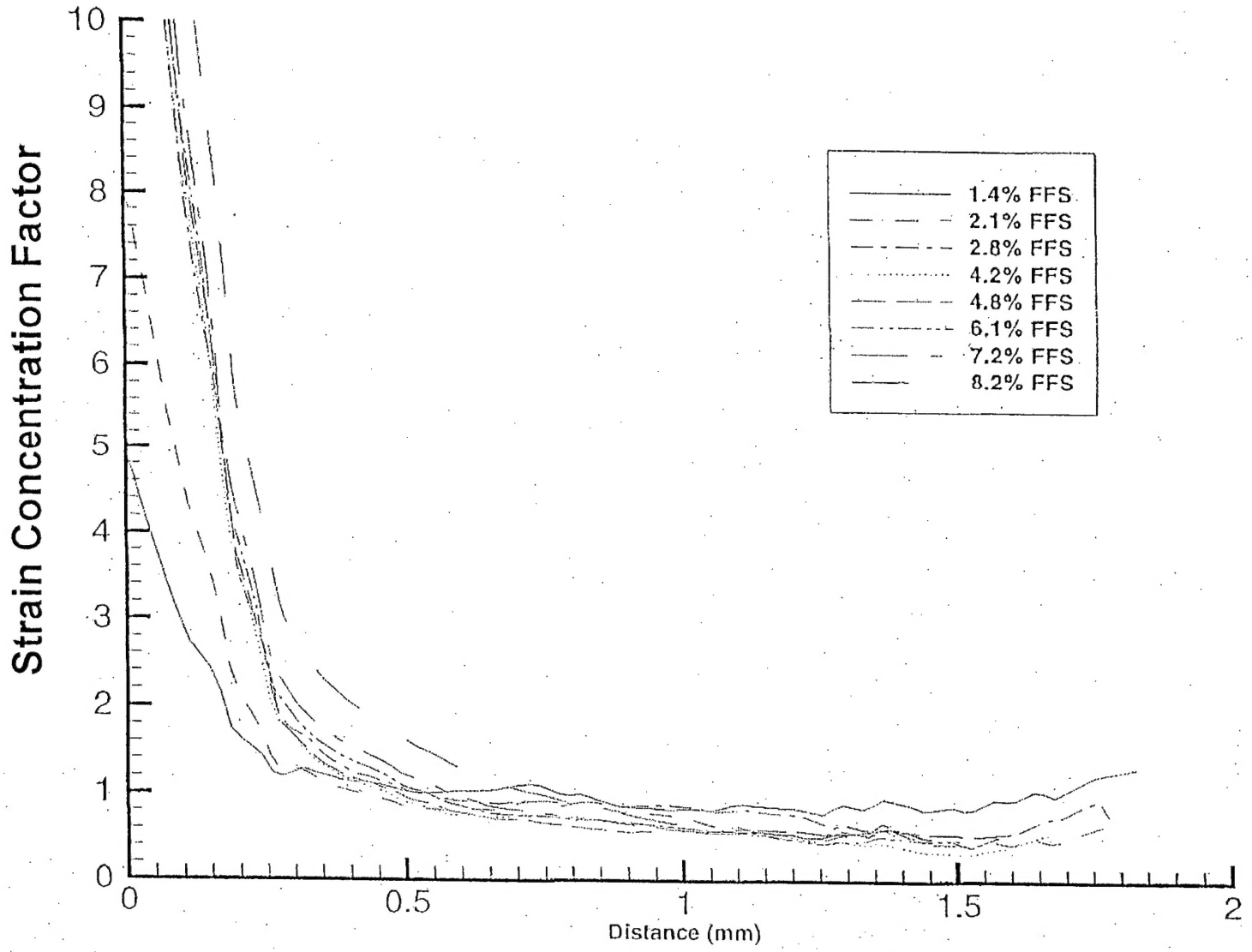


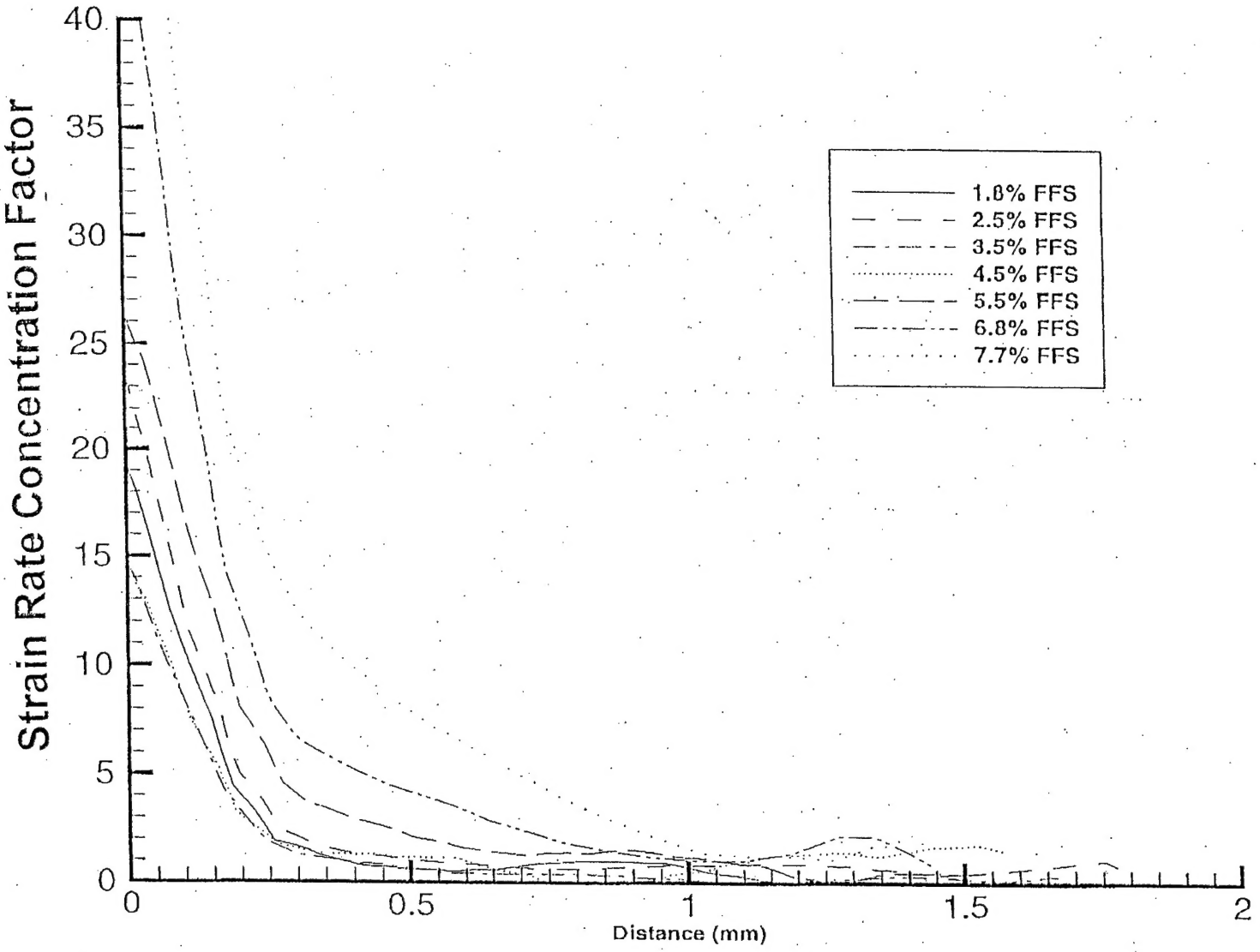
Maximum Principal Strain Distribution of 10.0% Far Field Strain During Loading



Strain Concentration Factors along the y=0 line for Far Field Strains from 1.4% to 8.2%



Strain Rate Concentration Factors along the y=0 line for Far Field Strains from 1.8% to 7.7%



Conclusions

- The strain distributions near a filler particle depend on time and the magnitude of the applied stress.
- Both tensile and compressive strains exist in the material.
- The microstructure of the material has a significant effect on the strain fields near the crack tip.
- The crack growth mechanism consists of void generation and coalescence with the main crack tip.